

REPORT
OF A
COMMISSION

CONSISTING OF

J. G. BARNARD,
COL. OF ENGRS AND BREVET MAJ. GEN. U. S. A.,

H. G. WRIGHT,
LT. COL. OF ENGRS AND BREVET MAJ. GEN. U. S. A.,

B. S. ALEXANDER,
LT. COL. OF ENGRS AND BREVET BRIG. GEN. U. S. A.,

UPON THE WORKS FOR THE

IMPROVEMENT OF THE SOUTH PASS

OF THE

MISSISSIPPI RIVER.

NOVEMBER 19, 1876.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1876.

[Special Orders No. 229.]

HEADQUARTERS OF THE ARMY,
ADJUTANT-GENERAL'S OFFICE,
Washington, November 2, 1876.

[Extract.]

1. By direction of the President of the United States, a commission, to consist of the following-named officers of the Corps of Engineers, is hereby appointed, to meet in New York City on November 6, 1876, or as soon thereafter as practicable, to report for the information of the Secretary of War an opinion upon certain subjects connected with the improvement of the South Pass of the Mississippi River.

Detail for the Commission.—Col. John G. Barnard, Lieut. Col. H. G. Wright, Lieut. Col. B. S. Alexander.

The commission will be governed by instructions to be communicated by the Secretary of War.

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By command of General Sherman :

E. D. TOWNSEND,
Adjutant-General.

Official :

L. H. PELOUZE,
Assistant Adjutant General.

WAR DEPARTMENT,
Washington, D. C., November 2, 1876.

GENTLEMEN: I present herewith for your guidance the instructions referred to in the enclosed special order.

The purpose in assembling your commission is not to interfere in any way with the duties of Maj. C. B. Comstock, the officer of Engineers, who has faithfully performed the duties assigned to him under the act, viz, "to report the depth of water and width of channel secured and maintained from time to time in said channel, together with such other information as the Secretary of War may direct," but to obtain your professional advice upon certain points which the law requires the Secretary of War to decide upon.

The questions upon which I desire your opinion are as follows :

First. Is the shoal at the head of the South Pass a part of that pass or of the main Mississippi River ?

If Mr. Eads obtains a channel twenty feet in depth in the South Pass, exclusive of this shoal, is he entitled under the law to his first payment of half a million dollars ?

Second. What depth and width of channel is it desirable to secure permanently through this shoal ?

Third. What is your interpretation of the words "average flood-tide" as used in the second section of the act ?

It appears from the records that on the 18th May, 1875, Major Comstock propounded this same inquiry to the Chief of Engineers, (copy of his letter herewith,) and that that officer decided, and the Secretary of War approved his decision, that "the average flood-tide should be

determined by excluding the effects of variations in the river's discharge."

Mr. Eads now appeals to have this decision set aside for the reason that "average flood-tide cannot be determined at the head of the pass, if any of the natural conditions affecting that level are disregarded."

* * * "Neither the mean effect of the winds nor the mean effect of the rise and fall of the river can be ignored in determining the plane of mean or average flood-tide even at the mouth of the pass, nor can either one be disregarded in fixing the plane of 'average flood-tide' at the head of the pass."

In this connection you will please examine the United States Engineer's gauge, and recommend what point upon it should indicate the plane of "average flood-tide" or zero of reference for all measurements of depth.

Fourth. I desire a full expression of your opinion as to "the materials used and the character and permanency with which the jetties are being constructed," and as to whether the work is being constructed according to the spirit of the act, as mentioned in the tenth section thereof.

Fifth. I should be glad to receive any general suggestions, in connection with this very important work, which you think will assist me in performing the duties required of the Secretary of War by this act.

In order to assist you in forming your opinion you are authorized to visit the works at the South Pass, and to proceed to this city, if you consider it necessary to consult any records here.

The sum of \$2,000 will be placed to your credit from the appropriation for contingencies of the Army, and it is hoped that your expenses may be kept within that sum.

A copy of these instructions has been sent to Major Comstock, and he has been directed to afford you every facility in his power to aid you in your investigations.

Mr. Eads has also been notified of your appointment, and has been informed that you will be ready to receive any communications he may wish to submit to you.

The unpublished records on this subject are now in my office, and will be open to your inspections, or copies will be sent to you if desired.

The printed documents you are probably familiar with, including the three reports by Major Comstock upon the progress of the works. The fourth report of that officer, dated September 20, and giving the depth of water on August 17, is now in the hands of the printer, and will be forwarded to you as soon as received.

Major Comstock has also been requested to make another survey during the present month.

I desire that your investigations be prosecuted with the utmost dispatch consistent with their great importance.

If it is feasible to send me your report, or a summary of its conclusions, in time to be incorporated in my annual report on November 20, I particularly request that you will do so.

Very respectfully, your obedient servant,

J. D. CAMERON,
Secretary of War.

Col. JOHN G. BARNARD,
Corps of Engineers.
Lient. Col. H. G. WRIGHT,
Corps of Engineers.
Lieut. Col. B. S. ALEXANDER,
Corps of Engineers.

REPORT.

NEW ORLEANS, LA., November 19, 1876.

SIR: The commission appointed by virtue of Special Orders No. 229, dated Headquarters of the Army, Adjutant General's Office, Washington, November 2, 1876, has the honor to report, that its members assembled on the 6th day of November, in New York, and organized. Your letter of instructions, dated War Department, Washington, November 2, was received and considered, and on the evening of the 7th the officers of the commission started by railway for New Orleans, arriving there on the afternoon of the 10th; Maj. C. B. Comstock, United States Engineers, the officer appointed according to the act of Congress "to report the depth of water and width of channel secured and maintained from time to time," joining them at Cincinnati. At New Orleans they met Mr. James B. Eads, and, at a preliminary meeting in the evening of the 10th, listened to suggestions he had to make; and on the following day examined the maps of recent surveys of works at the South Pass, which were exhibited to them in his New Orleans office. On the 12th, they proceeded by the revenue-cutter Dix, which had been placed at their disposal for the performance of their duties, to Port Eads, South Pass. The four following days, viz, the 13th, 14th, 15th, and 16th, were devoted to examining the works at the sea-entrance to the South Pass, at the head of the pass, and at Grand Bayou; likewise the plans of the works and the surveys showing their present condition, laid before them by Major Comstock, and also by the engineers employed by Mr. Eads, and to discussions; during which Mr. Eads and his assistants, as well as Major Comstock, were invited freely to impart information and to present their views.

After mature consideration of the information thus obtained, they now have the honor to report, in response to the five queries propounded to them in your letter of instructions, as follows:

QUERY 1. "Is the shoal at the head of the South Pass a part of that pass or of the main Mississippi River?"

"If Mr. Eads obtains a channel twenty feet in depth in the South Pass exclusive of this shoal, is he entitled under the law to his first payment of half a million dollars?"

In answer to the first paragraph of the foregoing, we would say that this shoal is not exclusively a part of the South Pass, for it extends entirely across the river from shore to shore. It is therefore a shoal common to all three of the passes; but the channel (or channels) through this shoal, by which access has been had or is to be had in future from the river above into the South Pass, is a part of that pass. This construction we believe to be in harmony with the views of the commission of 1874, which estimated the total length of the "South Pass" at 12.9 miles, thus embracing the entire distance from the deep water in the river above to deep water in the Gulf.

To the second paragraph of this query we answer, Yes; provided the depth so obtained has a bottom width required by the fifth section of the act of Congress.

The obligation of the United States to pay half a million of dollars on obtaining a channel twenty feet in depth, and of not less than two hun-

dred feet in width, is expressed in that section in terms which apply exclusively to the "wide and deep channel, between the South Pass of the Mississippi River and the Gulf of Mexico." The obligations of Mr. Eads in reference to the shoal at the head of the pass are expressed in the second proviso to section 4 of the act, the language of which provides all necessary guarantees, and is the only language of the law defining depths, &c., which does apply to this shoal.

QUERY 2. What depth and width of channel is it desirable to secure permanently through this shoal?

The second proviso to section 4 of the act demands a navigable depth "through said pass," and of course through this shoal, of "twenty feet" within thirty months; and "an additional depth of not less than two feet during each succeeding year thereafter, until twenty-six feet shall have been secured." We deem these depths to be satisfactory; and, considering that an inland channel requires less depth for equal facility of navigation than a sea-exposed bar, that they are fairly equivalent to the greater depths demanded by the act in its fifth section for the "wide and deep channel connecting the pass with the Gulf of Mexico."

With regard to the width of channel through this shoal, it is probable that all the necessities of commerce would be satisfied, at least for a time, by a width sufficient for the passage of a single vessel. One hundred feet would suffice for this purpose. We deem it desirable to provide ultimately a channel wide enough for two large ships to pass each other when under full headway, without danger of collision. This would require a bottom-width of, say, two hundred feet. Though this is somewhat greater than is now to be found in reaches of considerable length in the body of the South Pass itself, below Grand Bayou, we recommend it as a desirable width to be secured.

QUERY 3. What is your interpretation of the words "average flood-tide" as used in the second (fifth) section of the act?

The phrase "average flood-tide" is used in the section referred to only in reference to the depths prescribed in that section, which depths refer exclusively to the "wide and deep channel between the South Pass of the Mississippi River and the Gulf of Mexico," *i. e.*, to the channel to be created by "jetties and auxiliary works" through the sea-bar of the South Pass. The expression does not apply to the "navigable depth" to be secured "through the pass" in the second proviso of the fourth section of the act; and hence not to the depth to be secured through the shoal at the "head of the pass." The matter is left, as is the width, to be governed by the general prescription of providing a "navigable depth." This navigable depth ought to be found at the low as well as at the high stages of the river. We therefore consider the principle governing the decision of the Chief of Engineers in his endorsement on the letter of Major Comstock, communicated to us with your letter of instructions, to be the correct one for the head of the Pass, *viz*: that the measure of depths prescribed by the second proviso to the fourth section of the act should be from the level of average high tides "occurring during the stage of the river when the volume is least;" that is, the mean of the high waters of the river at this place, taken for one or more lunations when the river is at what is known as its low stage. Inasmuch, however, as Major Comstock found it necessary to fix provisionally his zero on insufficient data, it is recommended that it be revised on the principle above stated.

In reference to the prescriptions of the second (fifth) section of the act, the phrase "average flood-tide" has been universally accepted to

mean average high water of the tide; and, with no qualifications in the language, we understand this to mean the average of all daily observed high waters throughout the full cycle of a year. No complaint has been made as to the zero-mark fixed by the engineer officer for the determination of the depths of water at the gulf end of the Pass. It is possible that, having been established on a series of only three lunations from August 19 to November 9, it may vary slightly from what would be given by such a protracted series of observations. It is, however, our opinion that this zero, as established, is so nearly correct, that it need not be altered, for alteration would involve confusion in the comparison of future soundings with those heretofore made.

QUERY 4. I desire a full expression of your opinion as to "the materials used and the character and permanency with which the jetties are being constructed," and as to whether the work is being constructed according to the spirit of the act, as mentioned in the tenth section thereof.

The several reports of Major Comstock, the United States engineer officer, give a very precise description of the materials used. Maps No. 2 of his reports of June 9, 1876, (since printed as Ex. Doc. No. 77, Senate, Forty-fourth Congress, first session,) and of his fourth report of September 20, 1876, represent to the eye so clearly the section profiles, the component parts, the dimensions, and manner of construction of the two jetties, that we need add nothing descriptively. Our opinion thereon is expressed as follows:

The commission of engineers of 1874 gave the project for these works a protracted study, and set forth a plan and details, with estimates founded thereon. While Mr. Eads is, by the language of the act, "untrammelled in the exercise of his judgment and skill in the location, design, and construction of said jetties and auxiliary works," yet he is required by the law to construct "thoroughly substantial and permanent works, by which said channel may be maintained for all time after their completion." We find that in general plan the jetties of Mr. Eads correspond substantially with those designed by the board. The materials to be used, as recommended by the board, were, after methods long employed in Holland, to be of layers of mattresses, of willows or other suitable twigs or saplings, placed in layers, with intervening layers of quarry-stone. Still this design was in no respect obligatory upon Mr. Eads, nor should it have been upon an engineer officer of the United States charged to execute this work. With no experience in this country in the execution of such a work, in such a locality, and on this scale, it was impossible to foresee exactly what the work should be. The board expressly states that "it is of opinion that experience in construction may very probably show that the cross-section of the dikes may be reduced, thus lessening the cost." It was also an opinion of the board and other engineers that the methods of Holland would undergo material modification in their actual application in this country, and that experience in the work on the locality would also show the cheapest and best methods. Mr. Eads has modified very materially the Holland model of mattresses, and the mattresses he has used are doubtless much inferior to those of the Dutch. Again, the amount of stone thus far used has been very small indeed, barely enough to sink the mattresses. Nevertheless, the jetties so constructed, except at their ends in deep water, where some damage has been done, have resisted, without material injury, the floods, storms, and waves, and there has been more than a

year's exposure, with its winter and autumnal storms, for some portions of the existing work.

We do not conceive it to be required of Mr. Eads that each stage of the progress shall exhibit such "substantial and permanent work" as the law ultimately contemplates, but rather that each stage of the work shall show an adequacy to create a channel of the depth and width demanded, and at the same time such a fair and honest prosecution of the work as shall be, as far as it has gone, so much really accomplished toward the construction of works which, in the language of the law, "may be maintained for all time after their completion."

While we believe that engineer officers, applying moneys appropriated to meet their estimates by Congress, would have executed the work differently, especially in applying freely stone to each layer of mattresses, we are nevertheless of opinion that the work is being constructed essentially according to "the spirit of the act as mentioned in the tenth (thirteenth) section thereof."

We would add that the greatest variation from the sectional designs of the board of 1874 for the jetties, is to be found on their sea sides. That board recommended that the jetties should have on their sea sides the same slopes as on the river or channel side. As actually built upon the foundation mattresses, the sea sides are vertical. This construction appears to answer every purpose throughout most of the length, for the wide shoals on each side afford great protection, and there is, as had been expected, a great accumulation of river-sediment and wave-deposit against the exterior of the jetties by which that protection is augmented.

The outer ends of the two jetties, and especially the end of the eastern one, extend beyond their protection, and are greatly exposed; and we deem that an enlargement of section and a large application of stone to be essential to security.

QUERY 5. I should be glad to receive any general suggestions in connection with this very important work, which you think will assist me in performing the duties required of the Secretary of War by this act.

The more important of the duties imposed upon the Secretary of War by the act are embraced in the thirteenth section; and of these, the only one on which we have any suggestions to offer is that which requires him to see that the works shall be of such substantial and permanent character as shall maintain the channel for all time after their completion.

We have already remarked that we deem not only an enlargement of section, but a large application of stone to be essential to the security of the jetties, their sea ends especially, and we are of the opinion that this enlargement of section at the sea ends and consolidation throughout by the application of stone should be undertaken at once, and a reasonable progress therein be made the condition of the second and all future payments. The immediate and full consolidation of the jetties should be neither required nor expected, as they will continue to settle for some time, both by subsidence of the bottom upon which they rest, and by the compression of the mattresses of which they are largely composed. But this settlement and consolidation should be hastened, as has just been remarked, by the application of stone from time to time, so that they may be in condition to receive their final finish as soon, at least, as the expected full depth of water in the channel has been obtained.

The present works at the head of the pass are mostly of a tentative

and temporary character, and as their proper positions are determined should be replaced by substantial and permanent structures, to be completed before final payments are made.

Respectfully submitted.

J. G. BARNARD,
Col. of Eng. and Bvt. Maj. Genl.

H. G. WRIGHT,
Lt. Col. of Engrs., Bvt. Maj. Genl.

B. S. ALEXANDER,
Lt. Col. Engrs., Bvt. Brig. Gen., U. S. A.

Hon. J. D. CAMERON,
Secretary of War, Washington, D. C.

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